C. Stella and Jeri each rewrote the expression for the area of the outdoor part of the pool to help them make a sketch.

$$\text{Stella:} \quad x^2 + \frac{\pi x^2}{8} + \frac{\pi x^2}{8}$$

$$\text{Jeri:} \quad \left(\frac{1}{2}x\right)(2x) + \frac{\pi x^2}{4}$$

1. Explain the reasoning each person may have used to write their expression.

2. Decide if these expressions are equivalent to the original expression in Question A, part (2). Explain your reasoning.

D. Does the equation for the area of the pool represent a linear, exponential, or quadratic relationship, or none of these? Explain.

ACE **Homework starts on page 12.**

1.4 Diving In

In the pool tile problems, you found patterns that could be represented by several different but equivalent symbolic expressions, such as:

$$4s + 4$$
$$4(s + 1)$$
$$s + s + s + s + 4$$
$$2s + 2(s + 2)$$

The equivalence of these expressions can be shown with arrangements of tiles. Equivalence also follows from properties of numbers and operations.

An important property is the **Distributive Property:**

For any real numbers a, b, and c:

$$a(b + c) = ab + ac \text{ and } a(b - c) = ab - ac$$

For example, this property guarantees that $4(s + 1) = 4s + 4$ for any s.

We say that $a(b + c)$ and $4(s + 1)$ are in *factored form* and $ab + ac$ and $4s + 4$ are in *expanded form*.

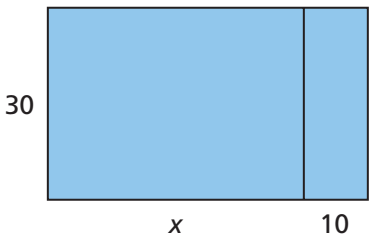
The next problem reviews the Distributive Property.

Getting Ready for Problem 1.4

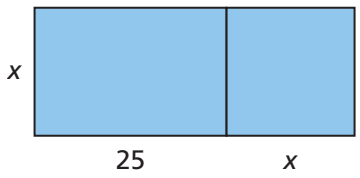
Swimming pools are sometimes divided into sections that are used for different purposes. A pool may have a section for swimming laps and a section for diving, or a section for experienced swimmers and a section for small children.

Below are diagrams of pools with swimming and diving sections. The dimensions are in meters.

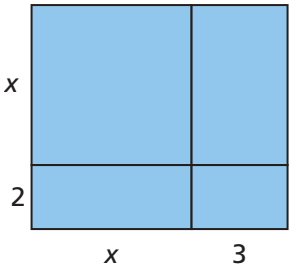
1.



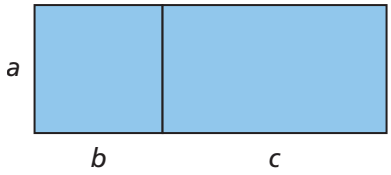
2.



3.



4.



- For each pool, write two different but equivalent expressions for the total area.
- Explain how these diagrams and expressions illustrate the Distributive Property.

The Distributive Property, as well as the Commutative Property and other properties for numbers, are useful for writing equivalent expressions. The Commutative Property states that $a + b = b + a$ and $ab = ba$, where a and b are real numbers. These properties were discussed in previous units.

Problem 1.4 Revisiting the Distributive Property

A. Write each expression in expanded form.

1. $3(x + 5)$

2. $2(3x - 10)$

3. $2x(x + 5)$

4. $(x + 2)(x + 5)$

B. Write each expression in factored form.

1. $12 + 24x$

2. $x + x + x + 6$

3. $x^2 + 3x$

4. $x^2 + 4x + 3$

C. The following expressions all represent the number of border tiles N for a square pool with side length s.

$$4(s + 1)$$

$$s + s + s + s + 4$$

$$2s + 2(s + 2)$$

$$4(s + 2) - 4$$

$$(s + 2)^2 - s^2$$

Use the Distributive and Commutative properties to show that these expressions are equivalent.

D. Three of the following expressions are equivalent. Explain which expression is not equivalent to the other three.

1. $2x - 12x + 10$

2. $12x - 2x + 10$

3. $10 - 10x$

4. $10(1 - x)$

E. Copy each equation. Insert one set of parentheses in the expression to the left of the equal sign so that it is equivalent to the expression to the right of the equal sign.

1. $6p + 2 - 2p = 4p + 12$

2. $6p + 2 - 2p = 6p$

ACE Homework starts on page 12.